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position can generally be ascertained within about two minutes of arc.

November, 1903.

## PLANETARY PHENOMENA FOR MARCH AND APRIL, 1904.

BY MALCOLM MCNEILL.

### PHASES OF THE MOON, PACIFIC TIME.

Full Moon, March 1, 6 <sup>h</sup> 48 <sup>m</sup> P.M.	Last Quarter, April 7, 9 <sup>h</sup> 53 <sup>m</sup> A.M.
Last Quarter, " 8, 5 1 P.M.	New Moon, " 15, 1 53 P.M.
New Moon, " 16, 9 39 P.M.	First Quarter, " 22, 8 55 P.M.
First Quarter, " 24, 1 36 P.M.	Full Moon, " 29, 2 36 P.M.
Full Moon, " 31, 4 44 A.M.	

On the evening of March 22d the first-magnitude star *a Tauri* will be occulted by the Moon. The occultation will be visible from most parts of the United States, but the exact times vary so that the time for one place does not give much aid in estimating the times for other places. Another occultation of the same star will occur on April 18th, but it can probably not be seen from any part of the country except possibly the extreme west.

There will be an annular eclipse of the Sun on March 16th. The path of the annulus runs from eastern Africa, through the Indian Ocean, Siam, and ends in the Pacific. This is one of the two eclipses of the year. The other will come on September 9th, and will be total solar.

The Sun passes the vernal equinox and spring begins March 20, 5 P.M., Pacific time.

*Mercury* is a morning star at the beginning of March, but is too near the Sun for naked-eye observation, rising only about forty minutes before sunrise. It rapidly approaches the Sun, passing superior conjunction and becoming an evening star on the afternoon of March 26th. After that it rapidly increases its distance from the Sun until it reaches greatest east elongation, 20° 12', on the afternoon of April 21st. It then remains above the horizon for an hour and three quarters after sunset, and may be easily seen in the evening twilight. At the end of April it sets about an hour and a half after sunset. The

last two weeks in April give the best chance of the year for seeing the planet as an evening star. It passes only  $5'$  south of *Jupiter*, just five hours after passing conjunction with the Sun on March 26th. Unfortunately the proximity of the Sun prevents observation even with a telescope. *Mercury* is in conjunction with *Mars*,  $1^{\circ} 16'$  north, on the afternoon of April 8th, and it is barely possible that the two planets may be seen near together on the evening of that day.

*Venus* is still a morning star, but is moving eastward faster than the Sun, and the two bodies are therefore apparently drawing nearer. On March 1st it rises an hour and one half before sunrise, but by the end of April the interval has diminished to about forty minutes. On account of the superior brightness of *Venus*, the planet can probably still be seen before sunrise, although none of the other planets, except possibly *Jupiter*, could be seen with the naked eye at this short distance from the Sun. It is in close conjunction with *Saturn*, passing  $0^{\circ} 20'$  north on the evening of March 7th, and with *Jupiter* on the morning of April 23d, passing  $0^{\circ} 30'$  south.

*Mars* still remains an evening star, but toward the end of the two-months' period it is rather too near the Sun for naked-eye observation. On March 1st it sets about two hours after sunset, and at the end of April less than forty minutes after. As in January and February, the local mean time of setting remains nearly constant,  $7^{\text{h}} 36^{\text{m}}$  P.M. on March 1st,  $7^{\text{h}} 33^{\text{m}}$  on April 1st, and  $7^{\text{h}} 26^{\text{m}}$  on May 1st.

*Jupiter* is also near the Sun. On March 1st it sets a little more than an hour and a half after the Sun; but the apparent distance between the bodies grows rapidly smaller, and the planet passes conjunction on the morning of March 27th. It then becomes a morning star, and is rapidly left behind by the Sun in their common eastward motion, so that by the end of April it rises about an hour and three quarters before sunrise.

*Saturn* is also a morning star, rising about an hour before sunrise on March 1st, and at the end of April at a little before 2 A.M. During this time it moves about  $5^{\circ}$  eastward and a little northward in the eastern part of the constellation *Capricorn*. As seen in the telescope, the rings appear less wide open than when the planet was seen as an evening star during the

early winter, the ratio of minor to major axis being less than one fourth on April 30th. This shutting up of the rings has a material effect in diminishing the brightness of the planet.

*Uranus* continues to rise earlier, before 3 A.M. on March 1st, and before 11 P.M. on April 30th. It is in the western part of *Sagittarius*, and moves eastward until April 4th, and then moves westward, about half of one degree each way.

*Neptune* is in the western sky throughout the evening, setting at about 3 A.M. on March 1st, and at about 11 P.M. on April 30th. It is in *Gemini*.

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